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BY H. E. GRAY AND F. L. WATTERS

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SB190

CONTROL OF INSECTS IN FARM-STORED GRAIN IN WESTERN CANADA [1]

By

H.E. Gray
Stored Product Insect Unit
Ottawa

and

F.L. Watters
Laboratory of Entomology
Winnipeg, Manitoba

Farmers in Western Canada may suffer considerable losses of grain when high yields and low delivery quotas make it necessary to store grain on farms for long periods. Losses occur when insects, mites, or moulds attack stored grain, causing it to heat and go out of condition. These losses may be prevented by following a few simple rules and practices.

The cause of most grain-storage problems in Western Canada is "tough" grain; grain that remains uniformly dry will not spoil. Therefore, the farmer's first task is to bin grain as dry as possible in a clean, weatherproof, well-ventilated granary. Secondly, the grain should be examined periodically, because leaks, seepage, or condensation may introduce excessive moisture and cause local heating. Thirdly, if heating and insect infestation should develop, serious damage may be prevented by transferring the grain to another place in cold weather.

STORING THE GRAIN

A granary with a wooden floor above the ground is best for farm storage, and several small granaries are better than a large one for long-term storage. If "tough", damp, weed-infested grain must be stored, keep it in small bins and market it first. Carry out the following procedure:-

1. Repair leaky roofs, windows, and doors to exclude rain and snow. If the granary floor is of concrete, cover it with moisture-proof paper.

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2. Clean the walls and the floor thoroughly. Sprinkle a little hydrated lime over the floor and sweep it about to fill all the cracks.

3. If insects or mites were present the year before, spray the walls and the floor with two per cent Pyrenone at the rate of one gallon per 1,000 square feet with a knapsack pressure sprayer. Allow the surface to dry thoroughly before filling the granary.

4. Fill the granary to the plate only. Ample space between the grain surface and the roof must be provided for ventilation.

Protective Dusts.— To protect grain from insects during storage, Pyrenone Wheat Protectant may be used. At a dosage of one pound to 10 bushels, this insecticide is effective against mites and beetles in grain. Apply the dust to the grain as it is being binned, or to the top six inches of grain already in storage. If you apply the dust uniformly during binning, the grain will remain relatively free from insects for several months. If you apply it only at the surface, it will be effective only against surface infestations. It is important that grain be dry when treated; dust insecticides are usually less effective in "tough" grain.

EXAMINING THE GRAIN

Grain that is stored in a dry condition may still become "tough" and infested. Moisture may enter the granary from outside as rain, snow, or ground moisture; and especially in large granaries, the moisture of the grain itself may condense in the surface layers of grain. To detect these danger spots, examine the grain as follows:-

1. Examine all grain stocks every two weeks.

2. Look for damp or crusted areas on the surface of the grain. Thrust the hand into the grain here and there to detect heating, and smell the grain to detect any abnormal odour.

3. Carry a metal rod or pipe of small diameter and push it three or four feet into the grain here and there. You will detect "tough" grain below the surface, for the rod will not pass through it so easily as through dry grain. Leave the rod

for ten minutes at full depth in the centre of the bin, and on withdrawal test it for warmth on the back of the hand.

WINTER TRANSFER AND CLEANING OF GRAIN

When unfavourable harvesting conditions make it necessary to store "tough" grain, heating and infestation may develop despite all precautions. The farmer's greatest ally then is the cold winter weather prevalent on the prairies. To take advantage of low temperatures in preserving grain, one must expose it in a relatively thin layer, for bulk grain is a good insulator. Carry out the following measures:-

1. During cold weather transfer grain that is infested, mouldy, or abnormal in odour to a clean granary, the bare ground, or a tarpaulin on the ground.

2. Clean the grain during the transfer if possible. Use a portable elevator discharging to a sloping chute fitted with a six-foot section of screen. Such a chute is easily made to suit individual requirements. Or you may use a fanning mill, a combine, or a threshing machine (preferably with the cylinder removed). Use a strong air blast and a light feed of grain. Destroy the material removed. "Tough" grain cleaned and cooled by transferring it under freezing temperatures may remain in good condition for a considerable time.

GRAIN-INFESTING INSECTS

The previous sections have dealt with detecting and preventing spoilage and insect infestation in stored grain. Despite your best efforts to protect your grain, insects may infest it. The regular program of inspection should enable you to detect the infestation in the early stages.

Several kinds of insects attack grain. Some feed on whole kernels or grain dust; others feed on the moulds associated with "tough" or damp grain when it goes out of condition. In either case the presence of insects in grain is a sign that it is being damaged.

Insect pests of grain usually cause visible damage through their feeding. They also give off both heat and moisture, which accumulate about the infested spot. This increases insect activity and results in the freeing of more heat and moisture, producing a typical "hot" spot in the grain mass. If allowed to go unchecked, the mould spores soon germinate, the moulds

reproduce, and spoilage of the grain follows. Under these conditions, the surface of the grain often becomes "tough", damp, or crusted.

Grain-infesting insects are widely distributed across the country. Some of them multiply slowly in sheltered places in granaries and below the floors of other farm buildings. In normal times these pests are few in numbers and go unnoticed. They become abundant and troublesome when grain is stored in large bulk; "tough" or damp grain is especially attractive. Some of the pests that multiply rapidly in warm, damp grain are described below.

Rusty Grain Beetle

The rusty grain beetle is a serious pest of stored grain. The beetle is one-sixteenth of an inch long and reddish-brown in colour; it moves rapidly in warm grain. The larva, or grub, feeds on the germ of the wheat kernel. It may also feed on barley and oats. A heavy local infestation in a grain bulk frequently causes the grain to heat. This lessens germination and impairs its milling and baking qualities.

Mites

Mites usually occur in "tough" or damp grain, giving it a strong musty odour. They are minute, fragile creatures that can hardly be seen except through a magnifying glass. Mites may feed on grain dust as well as the whole kernel. The infestations are usually found near the surface of heating grain.

Fungus Beetles

Fungus beetles are often attracted to mouldy grain. They feed primarily on moulds but may also feed on other insects. When present in large numbers they may contribute to the heating of grain. They are generally of little economic importance in grain and are frequently mistaken for more serious pests.

FUMIGATION

Deal with insect infestations as soon as possible. You may use either mechanical or chemical control methods; you may often need a combination of the two. The mechanical methods have already been discussed under "Winter Transfer and Cleaning of Grain".

The chief method of chemical control of grain insects is fumigation. Fumigants should be applied only after the surface crust is broken. Fumigation itself will not cool the grain; it only controls the insects that cause heating. Fumigants should be applied with care according to the manufacturers' directions. They are poisonous to man as well as to insects; also, grain may be down-graded or rejected if the appearance or quality indicates that the fumigants have been improperly applied.

A fumigant may be used to control infestations in grain that cannot be conveniently moved and cleaned. It is usually applied as a liquid to the surface of the grain, evaporating to form a poisonous gas that sinks through the grain mass. Take extreme care to avoid accidents during application.

The effectiveness of fumigation varies with the temperature of the grain, its moisture content, and the structure of the granary. Fumigation is somewhat less effective in cold grain because the liquid does not vaporize so readily to form a gas. Insects are also more difficult to kill in cold grain. If grain is "tough" or damp it absorbs some of the fumigant and the dosage must be increased, sometimes up to 20 per cent more than normally recommended, to obtain satisfactory results. The dosage should also be increased if grain dockage is high. Steel granaries are easier to fumigate than wooden ones, and tight wooden granaries require less fumigant than loosely constructed ones.

Before applying a fumigant on the surface of the grain, seal the building on the inside with paper. If the walls are not tight, apply a double layer of building paper on the outside This will help to maintain a high concentration of gas in and above the grain.

On the basis of the dosage used, fumigants may be classified as small- or large-bulk fumigants. Small-bulk fumigants (applied at dosages of 3 to 5 pounds per 1,000 bushels) may be packaged in one-pound cans or bottles, or in steel cylinders. Large-bulk fumigants (applied at dosages of 2 to 3 gallons or more per 1,000 bushels) are furnished in five-gallon cans or drums. The nature of the material and the type of packaging determine the method of application.

Table I gives dosages and methods of application for some fumigants for treating grain stored on farms under different conditions. The basis of selection of the fumigants is: (a) effectiveness, (b) suitability (no detrimental effects on the product treated), and (c) availability.

Table I

Dosages and Methods of Application of Some Grain Fumigants

Available for Treatment of Farm-Stored Grain

Fumigant	Container	Dosage per 1,000 bushels			Method of application*	Precautions
		Steel bins	Wooden bins	Open piles covered with tarpaulins		
Dawson 73	1-lb. can	3 lb.	5 lb.	5 lb.	Distribute cans uniformly over surface, puncture bottoms (beware of spray), and thrust into grain.	WEAR GAS MASK. WORK IN PAIRS.
Larvacide	1-lb. bottle	3 lb.	5 lb.	5 lb.	Fit bottles with wicks, distribute uniformly over surface, turn upside down, and thrust into grain.	WEAR GAS MASK. WORK IN PAIRS.
Dawson 73 or Larvacide	1-lb. can 1-lb. bottle	3 lb.	5 lb.	5 lb.	Pour 3 to 4 oz. of fumigant into short iron pipes at intervals over surface.	WEAR GAS MASK. WORK IN PAIRS.
Dawson 73 or Larvacide	cylinder (under pressure)	3 lb.	5 lb.	5 lb.	Apply from outside through plastic tube with perforated end section buried below grain surface.	WORK IN PAIRS. HAVE GAS MASK ON HAND.
Dowfume EB-5 Weevilcide	can or drum	2 gal.	3 gal.	3 to 4 gal.	Apply to grain surface as quickly as possible with pressure sprayer (spray nozzle removed).	APPLY FROM OUTSIDE OF BUILDING OR NEAR OPEN DOOR. HAVE GAS MASK ON HAND.

* Seal granary as tightly as possible before fumigation.

Small-bulk Fumigants.— If the fumigant is supplied in one-pound cans, space them evenly over the surface. Puncture the bottoms of the cans, holding the cans so that you are not sprayed by fumigant. Then thrust the cans about six inches into the grain.

When the fumigant is supplied in one-pound bottles, remove the stopper and place a wad of absorbent cotton or cellucotton

in the neck of the bottle. This should be snug enough to hold the contents when the bottle is turned upside down, yet loose enough to act as a wick when the bottle is thrust into the grain. Do this operation in the open air. Space the bottles evenly over the surface, turn them upside down, and then thrust them about six inches into the grain.

Fumigants supplied in one-pound cans or bottles may also be poured from the container into short probes that have outlet holes at the bottom. Heavy infestations and "hot" spots may occur at various places in the grain bulk. Fumigants applied at the surface tend to go around "hot" spots. The fumigant should therefore be applied directly to such spots by the use of probes.

Wear a gas mask fitted with a black (organic vapours) canister during the application of the Dawson 73 fumigant. Use a yellow (organic vapours and acid gases) canister for Larvicide.

When you use cylinders, apply the fumigant from outside the granary. Connect a plastic tube to the cylinder outlet and extend it upward through the eaves to the surface of the grain. The end-section of the tube should contain a number of holes; lay this out in the form of a large coil on the grain and then bury it about six inches below the surface. The fumigant is forced into the tubing by the pressure from the cylinder.

Large-bulk Fumigants.— A different method of application is used when grain is treated with large-bulk fumigants. For small quantities of grain, a knapsack pressure sprayer with the nozzle removed is suitable. A power sprayer suitable for applying chemicals to crops may be used for treating large quantities of grain in small annexes and barns. Remove the spray nozzle and apply the fumigant over the entire surface at the required dosage as quickly as possible. Make the application from outside the building or from an open door. Have an assistant present at all times. Fill the sprayer from drums in the open and avoid breathing the fumes. If fumes are noticeable during application, wear a gas mask.

If grain in open piles on the ground becomes infested, fumigate it. Any of the fumigants mentioned in the table may be used. Apply the fumigant as rapidly as possible on a calm day and cover the pile immediately with a tarpaulin weighted at the bottom.

Leave grain under cover or in storage for at least 10 days after fumigation.

Do not enter the fumigated space after the gas has been released until the end of the treatment period. When you do go into the treated space, be sure to wear a gas mask as long as any odour persists.

SAFETY FIRST

Your first duty while working with fumigants is to protect yourself. Always wear a gas mask, properly adjusted, when applying fumigants from the inside of buildings and NEVER WORK ALONE. If only one gas mask is available, tie a rope securely around your body and have an assistant stand in a doorway where he can see you at all times and hold the end of the rope while the application is being made.

A fumigant may cause blisters if the liquid remains in prolonged contact with the skin. Promptly remove clothing containing fumigant and wash the affected areas with water. The fumigant will evaporate in time, and there is no need to destroy wet gloves or clothing.

Symptoms of overexposure to most fumigants include dizziness, blurring of vision, vomiting, and abdominal pain. Remove the patient to fresh air and call a physician at once.

A gas mask is normally supplied in a protective case containing directions regarding its use. Read the instructions carefully before attempting to carry out fumigation. Replace gas mask canisters frequently.

FURTHER INFORMATION

Samples of grain fumigated against insects may be forwarded to the Laboratory of Entomology, 724 Dominion Public Building, Winnipeg, for examination to determine insect mortality.

For other information on the control of stored-grain pests, write to the Laboratory of Entomology, 724 Dominion Public Building, Winnipeg, or to the Stored Product Insect Unit, Canada Department of Agriculture, 375 Science Service Bldg., Ottawa.

(Trade names are used in this article because chemical names for the materials are difficult for general use and there are no official common names for them.)

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
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